

***Interactive comment on “Assessing the near surface sensitivity of SCIAMACHY atmospheric CO<sub>2</sub> retrieved using (FSI) WFM-DOAS” by M. P. Barkley et al.***

**M. P. Barkley et al.**

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Response to Referee 1

The authors would like to thank Referee 1 his/her useful suggestions and comments on this manuscript.

We have performed all technical corrections and have adjusted any potentially misleading sentences as suggested.

Specific Comments:

Page 2486, line2-5:

This analysis was performed with the FSI averaging kernels and not based on the work

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presented by Boesch et al, 2006. This has been made clear in the text.

Page 2487, Section 5.1:

Following the Referee's comments we have amended this section to ensure the reader can understand how the model simulations were done. The simulations are quite basic and have only been included to illustrate the difference between surface and column CO<sub>2</sub>.

The reason for the true columns seasonal cycle amplitude being over-estimated is, in part, caused by the use of a uniform CO<sub>2</sub> profile. This reason has been added to the text.

In the Southern hemisphere there is weaker seasonal signal at the surface than at higher altitudes, thus the CO<sub>2</sub> vertical distribution is more uniform and not 'weighted' towards the surface. We have made this clear in the text.

Page 2491, line 29 and Page 2492, line 15:

The FSI algorithm is very computationally expensive. The FSI algorithm had already processed SCIAMACHY data over the European scene for a previous paper thus this data was readily available. In the future we hope to have a global dataset which will eliminate any biases due to the geographical extent of the selected scene sampled.

Page 2491, line 23:

We have adjusted this sentence to avoid this ambiguity.

Page 2495, Line 25 and following:

As highlighted by the Referee errors owing to changes in the surface albedo, whether due to imperfect radiative transfer or residual clouds, cannot be totally ruled out.

However, the SCIAMACHY/FSI data strongly suggests that the changes in the CO<sub>2</sub> columns over course of the year are primarily due to terrestrial uptake and release (or

other surface sources and sinks) and not because of a dominant 'false' signal created by variations in the surface reflectance.

In order not to mislead any reader we have adjusted the sentence that begins this paragraph to:

"There are two arguments for eliminating a dominant possible (seasonal) surface reflectance bias."

Figure 2:

We only have the solar zenith angles (SZAs) for the SCIAMACHY averaging kernels and not for the FTS instrument otherwise the SZAs would definitely be added to the figure and caption.

Figs. 9, 17 and 18:

We will request that the typesetting office make Fig. 9 larger and that Fig. 18 occupy one full page within the published manuscript, which should make the print readable.

We have split Fig. 17 into three separate figures to make the text legible.

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Interactive comment on Atmos. Chem. Phys. Discuss., 7, 2477, 2007.

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